



**NZPork's Additional Paper on the Proposed Animal Welfare
Regulations (Care and Conduct and Surgical & Painful
Procedures) MPI Discussion Paper No: 2016 /12**

November 2016

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1. Introduction

This paper provides further information in addition to NZPork's submission (*NZPork's Submission on the Proposed Animal Welfare Regulations (Care and Conduct and Surgical & Painful Procedures)* MPI Discussion Paper No: 2016 /12 provided in May 2016), to assist MPI in setting regulations as prescribed under the Animal Welfare Act 1999 ("the Act"), that improve the clarity, transparency and enforceability of animal welfare requirements, in a manner that provides for welfare.

This paper considers only those issues where we have more information, clarification, or evaluation to add to our submission.

Following MPI's consideration of our submission and this paper, we look forward to 'workshopping' the proposed regulations with MPI, farmers and industry advisers. We believe the workshop will be valuable not only in ensuring that the final regulations proposed meet the requirements of the Act, but also that they are evaluated to ensure they complement the Animal Welfare (Pigs) Code of Welfare 2010, and the PigCare™ welfare assurance programme, in an effective programme to provide for pig welfare.

In addition we believe the workshop can be utilised to explore ways in which animal welfare policy and enforcement can be grounded and further developed, by incorporating educational initiatives and providing information on 'real world' farming to key sectors of society.

2. Legal requirements for proposed regulations

This section discusses the legal requirements for the proposed regulations. Subsequent parts of the paper discuss the application of these legal requirements where appropriate to various proposals for regulations.

The Act establishes a number of requirements the regulations must comply with.

Regulations made under s 183A(1)(a) must be "for the purposes of giving effect to Parts 1 and 2" of the Act.

The scope of Parts 1 and 2 can be found in ss 9 and 27. Section 9 concerns the care of animals, and s 27 concerns conduct towards animals. (While the proposed regulations are named as Care and Conduct and Surgical & Painful Procedures, the proposed regulations considered in this additional material fall within Part 1.)

The relevant parts of s 9 provide:

9 Purpose

- (1) *The purpose of this Part is to ensure that owners of animals and persons in charge of animals attend properly to the welfare of those animals.*
- (2) *This Part accordingly—*
 - (a) *requires owners of animals, and persons in charge of animals, to take all reasonable steps to ensure that the physical, health, and behavioural needs of the animals are met in accordance with both—*

- (i) *good practice; and*
- (ii) *scientific knowledge;*

If the regulations are consistent with one of the purposes in s 9 then the regulations will give effect to Part 1 and meet the requirements for regulations in s 183A(1)(a) of the Act. Conversely, if the regulations are not consistent with the purposes in s 9 then they will not give effect to Part 1 and the power to make the regulations under s 183A(1)(a) will not exist.

In order to give effect to Part 1 the proposed offences must ensure persons attend properly to the welfare of animals in their care. This is described in more detail in s 9(2)(a) as requiring persons to take all reasonable steps to ensure that the physical, health, and behavioural needs of the animals are met in accordance with both good practice and scientific knowledge.

The legal meaning of “physical, health and behavioural needs” is set out in s 4 of the Act as follows:

4 Definition of physical, health, and behavioural needs

In this Act, unless the context otherwise requires, the term physical, health, and behavioural needs, in relation to an animal, includes—

- (a) *proper and sufficient food:*
- (ab) *proper and sufficient water:*
- (b) *adequate shelter:*
- (c) *opportunity to display normal patterns of behaviour;*
- (d) *physical handling in a manner which minimises the likelihood of unreasonable or unnecessary pain or distress:*
- (e) *protection from, and rapid diagnosis of, any significant injury or disease,—*

being a need which, in each case, is appropriate to the species, environment, and circumstances of the animal.

Note that s 4 defines physical, health and behavioural needs in qualified not absolute terms and also sets out that such needs, are, *in each case, appropriate to the species, environment, and circumstances of the animal.*

We have some concerns about some of the proposed regulations, including their wording. In some cases this is due to the difficulty of defining a ‘black and white’ single requirement suitable for regulation, non-compliance with which will constitute an offence. Animal welfare is a holistic concept and net welfare is the outcome of the interaction of a number of factors. This is a concern NZPork has consistently raised since the concept of regulatory offences was first proposed to be applied to animal welfare.

3. PigCare™

One of the general questions posed in MPI’s Discussion Paper was whether there should be wider use of non-regulatory mechanisms. In our submission we expressed strong support for the concept of utilising both regulatory and non-regulatory mechanisms to provide for welfare in our submission.

We used PigCare™, the New Zealand pork industry's welfare assurance programme, as an example of an effective non-regulatory mechanism. PigCare™ incorporates an animal-based welfare assessment developed by Massey University, which also encompasses assessment against the minimum standards in the Animal Welfare (Pigs) Code of Welfare 2010. PigCare™ now operates throughout the commercial industry with the support of the supply chain. It is independently managed with auditing undertaken by trained, calibrated auditors. Because it provides an animal-based assessment it addresses animal welfare in a holistic way.

PigCare™ has set a precedent for welfare assurance in New Zealand's animal industries for a number of reasons: its innovative animal – based assessment, and for the commitment of the whole industry to integrate PigCare™ into good production practice for New Zealand pig production.

We strongly recommend that the final proposals for pig-industry regulations are developed within the framework of the operation of PigCare™.

4. Types of offences and penalties

We have considered this matter further and also assessed the issued Calves Regulations as a precedent example of implementation emanating from the proposals presented in MPI's Discussion Paper.

MPI's Discussion Paper sets out that *regulations should only be considered if they are the appropriate mechanism to address a specific problem and the regulatory penalties available are proportionate to the level of offending. More severe omissions or actions will and should continue to be addressed via the offence provisions under the Act and associated higher penalties.* (p13).

In assessing whether an infringement offence or prosecutable offence is appropriate, not only does the seriousness of the potential offence (vis a vis the offence provisions under the Act) in not providing for welfare need to be considered, but also the complexity of the factual situations that may arise. If potential offences do not involve straightforward matters of fact then there may be grounds for setting prosecutable offences where review is required by a prosecutor before charges are laid, and then considered by a Judge in court, as there is little scope to challenge the facts of an infringement offence.

However, our view is that the seriousness of a potential offence should remain the critical factor in determining the type of offence.

Our view is setting proposals 25, 26, and 27 (lying space, dry sow stalls and farrowing crate dimensions) as prosecutable offences with criminal conviction is not justified. The conditions contained in these proposals are proxies for the welfare of the animal, and it is difficult to align these proposed offences with, for example, transporting a young calf that is not fit for transport (Animal Welfare (Calves) Regulations 2016 – regulation 6 which is an infringement offence with an infringement fee of \$500). Further inconsistent examples are seen with current regulation proposals such as proposal 14 which prohibits striking a horse around the head with a whip, lead or any other object and proposes that this is an infringement offence with a very modest fee of \$300; or proposal 16 which requires that tethered horses and donkeys have constant access to food, water and shelter, and proposes that this is also an infringement offence with a fee of \$300.

Of course where such potential offences are very severe and involve harm and distress to animals, then as recognised in MPI’s Discussion Paper (quoted above) these more severe situations can be addressed under the primary Act. We discuss this matter specifically in sections on these proposed regulations later in this paper.

5. Care and Conduct Proposals

24. Pigs – Dry sleeping area	
Proposal	<p>Pigs must have access to a dry sleeping area.</p> <p><i>Links to dog shade and dry sleeping area.</i></p>

In our submission we expressed support for the intent of this proposed regulation which we interpreted as a proxy for access to a “comfortable” lying / sleeping area.

We wish to add further clarification to this concept.

The commercial industry has a very strong recognition of the welfare need to provide a comfortable lying /sleeping area for pigs. For example, quantity and quality of lying area are factors which contribute significantly to the PigCare™ Presentation scoring system.

However, what constitutes a comfortable lying and sleeping area for pigs is variable depending on a number of factors: time of year (warm or cool temperatures), different housing systems, different ventilation systems, different drainage systems, and different feeding systems. In certain conditions pigs will choose a wet lying / sleeping area and will choose to make the whole area wet. Note also that after hosing a pen to clean it, an indoor pen floor can get all wet.

Everything considered, we are highly concerned about the actual wording used and the potential for misjudgement.

While the concept of a comfortable lying / sleeping area is obviously equally relevant to indoor and outdoor pigs our recommendation is that it is specified separately, as follows:

- For outdoor pigs, based on Minimum Standard 5 (a) in the Animal Welfare (Pigs) Code of Welfare 2010:

Pigs must be provided with dry and draught-free but adequately ventilated shelter.

Note ‘dry’ is appropriately specified here because outdoor pigs are also provided with an environment that can manage the effects of a hot environment such as wallows and shade.

- For indoor pigs, reflecting the basis of PigCare™’s assessment:

Any ponding covers less than 50% of the available floor area.

Type of offence and penalty

We support that it is an infringement offence, with a fee of \$300.

An offence and penalty of this nature would mean that this potential offence is appropriate for non-commercial, lifestyle farmers.

25. Pigs – Lying space for grower pigs

Proposal	Grower pigs housed inside on non-litter systems such as slatted or solid floors must have lying space of at least: Area (m²) per pig = 0.03 x liveweight^{0.67}(kg).
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We explained in our submission that when NAWAC was preparing the 2010 Code of Welfare for Pigs it consulted on a proposal for minimum space for grower pigs based on the 2005 Code of Welfare, which used the words “minimum space allowance”. Unfortunately, NAWAC when making decisions about the 2010 Code of Welfare removed the words “minimum space allowance” and substituted “lying space” without consulting any of the affected parties on the implications of the change. The change was very significant. Treating the minimum space as a “lying space” could be interpreted as meaning that both a feeding area and dunging area must also be provided. Following this interpretation would significantly raise the minimum space requirements for grower pigs.

Stating the minimum space allowance as the “lying space” requirement is in excess of the reasonable steps required by s 9(2)(a) to ensure the physical, health, and behavioural needs of grower pigs are met in accordance with good practice and scientific knowledge. As a consequence, the regulations will not be “for the purposes of giving effect to Part 1”, and there is no power to make the proposed regulations under s 183A(1) of the Act.

In addition, the allometric equation used in the minimum standard in the Animal Welfare (Pigs) Code of Welfare 2010, and proposed for regulation is based on research establishing the minimum space allowance, provided throughout the growing cycle, to provide for welfare.

We explained in our submission how space is actually provided in practice. Unlike the Spoolder *et al* research where the minimum space was approximately maintained throughout the whole growing cycle of pigs, in actual farming situations, because growers move through pens of fixed sizes, they only approach the minimum space right at the end of that growing period before they are moved to a larger pen.

For all these reasons, we therefore requested amendment to the proposed regulation as follows:

Grower pigs housed inside on non-litter systems such as slatted or solid floors must be provided with an area of, on average, at least: Area (m²) per pig = 0.03 x liveweight^{0.67}(kg).

Type of offence and penalty

We pointed out in our submission that the proposal to set this as a prosecutable offence and the very severe penalty proposed is inconsistent with the statement in MPI’s discussion paper: ‘*Will provide a proportionate response for low-level (emphasis from NZPork) outcomes from overcrowding*’.

Instances of low-level overcrowding are unlikely to involve actual serious harm to pigs. Of course if the offending is excessive or severe, it can be addressed under the primary Act.

For consistency therefore it is our strong recommendation that if this regulation, amended as requested, is progressed to address low-level outcomes from overcrowding, it is an infringement offence with a penalty commensurate with its recognised low level of welfare impact. For example, \$500.

An offence and penalty of this nature would mean that it is also appropriate for non-commercial, lifestyle farmers.

26. Pigs – Dry sow stalls

Proposal	Dry sow stalls must not be used.
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In our submission we supported the intent of this proposal, which became a minimum standard in the Animal Welfare (Pigs) Code of Welfare 2010, effective after December 3 2015. (Note NZPork established compliance with this minimum standard via a declaration required from each PigCare™ farm to maintain PigCare™ accreditation status.)

Type of offence and penalty

While the use of dry sow stalls is a relatively a black and white matter, it is difficult to justify that use constitutes a serious breach in welfare when NAWAC's view in the Animal Welfare (Pigs) Code of Welfare 2010 stated:

“Dry sow stalls and group housing both have welfare benefits and costs. The benefits of dry sow stalls are that sows can be individually managed, particularly for feeding, and there are no injuries from fighting. The benefits of group housing are the greater freedom of movement and ability to express other behaviours such as foraging, social and explorative behaviour in a varied environment.

NAWAC does not believe there are sufficient scientifically supported animal welfare benefits of dry sow stalls. Therefore NAWAC has decided that the use of dry sow stalls must be discontinued.”(p21)

Our recommendation is that the use of dry sow stalls is an infringement offence, with a fee of, for example, \$500. In the case of multiple dry sows in stalls then multiple infringement offences could be issued.

Definitions

In our submission we supported the definitions provided in the Animal Welfare (Pigs) Code of Welfare 2010 for “mating stall” and “dry sow stall”.

However we suggest it may be appropriate to refer to “insemination stalls” rather than mating stalls to more correctly describe their specific function; and for transparency, to include in the definition that their use is limited to one week for service.

Relevant definitions are:

Gilt – A young female pig, selected for reproductive purposes, before she has had a litter of piglets.

Dry sow stall - An enclosure in which gilts and sows are kept individually. Dry sow stalls are normally joined together in rows and used for total confinement of the animal.

Dry sow – A non-lactating sow.

(All the above definitions are from the Animal Welfare (Pigs) Code of Welfare 2010.)

And:

Insemination stall: An enclosure in which sows may be kept individually for ease of management at mating or for artificial insemination for no longer than one week. The sow may be moved out of the insemination stall for oestrus detection and natural mating. Some insemination stalls are designed to allow the boar to have physical contact with the sow for oestrus detection and for AI. (Note most gilts are naturally mated and housed in groups.)

27. Pigs – Size of farrowing crates	
Proposal	Prohibit keeping a sow in a farrowing crate where the sow cannot avoid touching the top of the crate, or touching both sides of the crate simultaneously, or touching the front and the back of the crate simultaneously.

In its “Review of the use of farrowing crates for pigs in New Zealand” (March 2016), NAWAC recommended to the Minister that the minimum standard include a length measure to “provide clarity”.

In our submission we requested amendment to this proposal because it sets a higher requirement than the current minimum standard. We pointed out that we would need time to consult with farmers to establish the extent to which new facilities may be required to meet this proposal, particularly when the use of farrowing crates had been under review. Within the very short consultation period provided to make a submission we did not have the time to consult with farmers.

We have since consulted with PigCare™ auditors.

Their feedback is that PigCare™ compliance requires the provision of farrowing accommodation that is comfortable for the sow. Because there is very wide variation in the size of gilts and sows within a herd there is no ‘one (farrowing crate) size that fits all’. However the provision of an appropriate farrowing crate size for all sows and gilts on farm can and has been met through corrective actions issued for PigCare™. Corrective actions vary in a number of ways based on the farm’s characteristics.

It is worthy of note that the most significant factor in managing sow size is managing their feed intake during the gestation period. The requirement to cease all gestation stall use in December 2015 and move to group housing throughout gestation has meant there has been an adjustment period for some farmers to manage the new system. If individual sow feed intake is not well controlled, there can be a large variation in the size of sows at farrowing.

Our recommendation is that the proposed wording is adjusted by adding the words in italics below for clarity:

Prohibit keeping a sow in a farrowing crate where the sow cannot avoid touching the top of the crate *with her back*, or touching both sides of the crate simultaneously, or touching the front and the back of the crate simultaneously.

Type of offence and penalty

We do not believe it is appropriate to align the potential offence with serious offences that involve causing harming or pain to an animal.

For consistency, our recommendation is that a proposed regulation on the size of farrowing crates, amended as requested, is an infringement offence, with a fee of, for example, \$500. In the case of multiple offences, then multiple infringement offences could be issued. Of course if the offending is excessive or severe, it can be addressed under the primary Act.

28. Pigs – Provision of nesting material

Proposal

Sows, in any farrowing system constructed after 3 December 2010, must be provided with material that can be manipulated until farrowing.

We explained in our submission that there was no consultation by NAWAC before this proposal was set as a minimum standard in the 2010 Pigs Code of Welfare. The proposal has not undergone any analysis of its consistency with good practice and scientific knowledge within commercial indoor farrowing systems. It is not a minimum standard because NAWAC is required to be satisfied that the proposed standards are the minimum necessary to ensure that the purposes of this Act will be met, and so cannot differentiate between the requirements for sows in facilities constructed before and after particular date. The proposal is not a requirement of s 9(2)(a) as it is not a reasonable step that owners and persons in charge of animals must take, in accordance with good practice and scientific knowledge, to ensure the physical, health and behavioural needs of the animals (sows and piglets) are met. As a consequence, the regulations will not be “for the purposes of giving effect to Part 1”, and there is no power to make the proposed regulations under s 183A(1) of the Act.

Since the issue of the 2010 Pigs Code of Welfare, the 2014 – 2016 NAWAC review of farrowing crates has concluded that *their use provides the best welfare outcome for the welfare needs of piglets and the best total welfare of piglets and sows, based on currently available farrowing practices and scientific knowledge and as appropriate to the environment and circumstances of the animals.*

Meeting the intent of the proposed regulation in farrowing crates – confirmed as above by NAWAC as commercially applicable best practice indoor farrowing systems - has a number of detrimental effects on the welfare of sows and particularly the piglets. This is because manipulable material cannot be provided to the pre-farrowing sows without compromising other welfare elements including hygiene and piglet survival, and compromising effluent management systems. This is the reason that EU regulation qualifies this provision:

In the week before the expected farrowing time sows and gilts must be given suitable nesting material in sufficient quantity unless it is not technically feasible for the slurry system used in the establishment.

NZPork is committed to operating to transparent world class welfare standards supported by science and good practice that can be implemented within commercial farming systems.

We have sought a summary of research to date from Dr Kirsty Chidgey: 'Research relating to nesting material for pre-parturient sows'. Dr Chidgey's paper is appended. This highlights the limited research that has been conducted on the provision of manipulable material within crates and the currently unanswered questions.

NZPork is also investing in research within the Australian Cooperative Research Centre (Pork CRC).

At present the Pork CRC runs four programme areas of focused research including 'Program 1 - Reduced confinement of sows and piglets'. Its research objective is to 'reduce and ultimately eliminate the need for sow confinement during farrowing, lactation and gestation through the development of innovative housing, breeding and suckling systems. Research outputs to also enhance the welfare and future productivity of piglets through innovative weaning processes that stimulate immunity and gut development of the piglet whilst reducing stress'.

Program 1 includes research projects investigating the use of manipulable material and bedding for sows at farrowing in farrowing crates. We have recently obtained a verbal update on some of this work and are waiting for further formal outcomes. For example, current research output summaries from Program 1 are to be presented at the forthcoming Pork CRC Stakeholders Meeting on Wednesday 23rd November in Melbourne Australia, which NZPork is attending.

Our strong recommendation is that this issue is not progressed as a regulation at this time until research has identified commercially applicable methods that enhance net welfare in a meaningful way; and it has been consulted on, and the full cost implications for commercial implementation has been assessed.

In its "Review of the use of farrowing crates for pigs in New Zealand" (March 2016), NAWAC noted 'that industry disagrees with this requirement and does not comply with this minimum standard'.

NAWAC misunderstood the current situation. There have been very few farrowing systems constructed since 2010. Those that have been constructed have addressed this requirement in ways to meet the 'letter' of the minimum standard e.g. provision of straw or shredded paper. The net welfare benefit however is very questionable.

6. Surgical & Painful Procedures Proposals

We did not comment in our submission on the types of regulation offences and penalties associated with the surgical and painful procedures proposals. We have requested to be a part of ongoing development of these regulations with MPI and all relevant stakeholders.

7. Inclusion of a ‘Mental Element’

In our submission in response to a general question, we expressed support for inclusion of a mental element (e.g. intention, knowledge, or recklessness) within the proposed regulations.

However our legal advice is that it would be unusual for a mental element to be included in a regulatory offence. Regulatory offences are appropriately strict liability offences with only a physical element needing to be proven. Inclusion of a mental element (e.g. intention, knowledge, or recklessness) should be dealt with under the primary Act.

APPENDIX

Summary: Research relating to nesting material for pre-parturient sows.

Dr Kirsty Chidgey, MSc (*First Class Honours*) PhD, November 2016

Summary: Research relating to nesting material for pre-parturient sows

Dr Kirsty Chidgey, MSc (*First Class Honours*) PhD

Hormonal control of nest building

It is widely acknowledged that the onset of nest building is triggered by endogenous stimuli (i.e. an internal, hormonal ‘trigger’). This begins with a rise in prolactin (Widowski et al., 1990; Castrén et al., 1993) and a concurrent decrease in progesterone and increase in prostaglandin (Burne et al., 2001; Algers and Uvnäs-Moberg, 2007). Nest building can be induced by administering prostaglandin to pregnant sows (Widowski et al., 1990). The completion of nest building is thought to be strongly correlated to the significant rise in oxytocin levels which occurs approximately 4 hours prior to expulsion of the first piglet (Castrén et al., 1993). A previous study found negative correlations between plasma oxytocin levels and nosing ($r = -0.8$, $P < 0.01$) and arranging nesting material ($r = -0.9$, $P < 0.001$) (Damm et al., 2002).

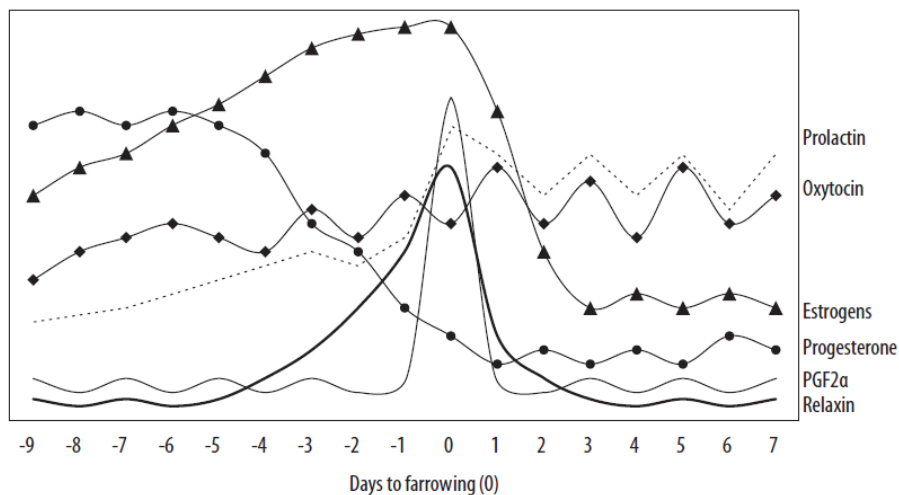


Fig. 1. Schematic representation of reproductive hormone concentrations during pregnancy in the sow (modified for Anderson, 2000) (Peltoniemi and Oliviero, 2015).

The second phase of nest building behaviour is substrate-orientated, thus depends on the provision of manipulable material. That is, the construction of a satisfactory nest serves as feedback to signal the completion of nest building. The results of previous studies indicate that providing nesting material has the effect of stimulating and encouraging nesting behaviour – so sows will perform more nesting behaviour when they are given a substrate to do so (Vanheukelom et al., 2012). However, space is also important at this time. Thus the combination of space and the availability of a suitable substrate at the appropriate time will influence the expression of nesting behaviour.

Providing nesting material to crated sows

Few studies have investigated the effect of providing crated sows with nesting material. Studies which have investigated the effect of providing bedding to sows pre-farrowing are often very small (~8 – 20 sows per treatment). In most cases it is the effect of providing straw to sows in *pens* that is examined, which suggests that the provision of nesting material is only worthwhile when sows have more space than that available in farrowing crates, thus enabling better utilisation of nesting material.

It is difficult to separate the effects of space and substrate when the experiments are conducted in pens only, as is the case in many studies (i.e. sows in pens with and without straw). A study examined whether space or nesting material had a larger impact on pre-farrowing behaviour in gilts, by housing gilts in crates (N = 17) or pens (N = 17), with or without straw (Jarvis et al., 2002). It was concluded that the provision of space had a greater effect on pre-farrowing behaviour (walking, standing, and more frequent posture changes) than the provision of nesting material (Jarvis et al., 2002). The effect of straw vs. no straw was investigated in pens and in crates previously, however only 24 sows (6 per treatment) were observed in this study (Cronin et al., 1994). It was stated that sows modify their pre-farrowing nesting behaviour in response to their environment, thus different nesting behaviour may have differing functions that depend on the environment. As such, comparing pre-farrowing sow behaviour in different farrowing systems may not be appropriate.

Gilts in farrowing crates and farrowing pens were provided with 2 kg of chopped straw daily (actual length not specified) from day 113 of pregnancy until farrowing (N = 23 gilts in crates and 21 in pens) (Andersen et al., 2014). They spent the same amount of time nest building 1 – 3 hours before farrowing, but gilts in pens spent more time nest building from 12 to 4 hours before farrowing (Andersen et al., 2014). Chopped straw may be more practical to use on farm, given the potential for blockage of existing drainage systems with long stemmed straw. However, long stemmed straw may occupy the sow for longer, so less may be needed overall. Furthermore, the amount of labour required may be reduced if staff members do not need to top up sows with straw as regularly.

One small study investigated the use of straw or tassel cloth in farrowing pens (N = 13 sows) (Widowski and Curtis, 1990). The findings of this study should be cautiously interpreted, given the small sample size. However, this is one of the first studies to introduce the concept of a manipulable and relatively resilient material that could help to accommodate a sow's behavioural needs pre-farrowing. At the beginning of this study, 1.5 kg of straw was spread on the floor of the farrowing pen to introduce sows to previously unfamiliar nesting material. On day 113 of gestation, all straw was removed from the floor of the pen and 3.0 kg of straw was provided to sows in a straw 'basket' (i.e. a straw rack) (Widowski and Curtis, 1990). If straw was replenished before farrowing, it was weighed, and any straw remaining in the basket after parturition was also weighed to account for the actual amount used per sow before parturition (Widowski and Curtis, 1990). In total, 8 of the 13 sows removed straw from the basket and used it to construct a nest. One sow ingested 3 kg of straw and used none

of it to build a nest. It was commented that straw became mixed with excreta, making it difficult to estimate how much was used and/or ingested (Widowski and Curtis, 1990). Prior to the day of farrowing, sows were described as being uninterested in the straw.

In order to analyse the results, sows were allocated to three categories: ‘nest’ (sows built a nest and were successfully observed for 24 h preceding farrowing), ‘no nest’ (sows used very little straw and were successfully observed for 24 h preceding farrowing), and ‘nest-short’ (sows used straw to build nest, but farrowed early and were not observed). Sows used an average of 2.3 kg of straw in the ‘nest’ group and 1.5 kg in the ‘no nest’ and ‘nest-short’ groups (Widowski and Curtis, 1990). Most nesting activity occurred between 15 and 4 hours before farrowing, peaking between 11 and 9 hours before farrowing (Widowski and Curtis, 1990). A further experiment investigated whether sows in farrowing crates (N =13) would engage with a material that could be manipulated, but was not able to be used to construct a nest. A cloth tassel was chosen, as this is manipulable, but cannot interfere with the drainage system (Widowski and Curtis, 1990). Tassel-pulling was recorded for 72 hours prior to farrowing. Results indicated that most sows performed the majority of tassel-directed behaviour between 12 and 4 hours before farrowing (Figure 2, Widowski and Curtis, 1990).

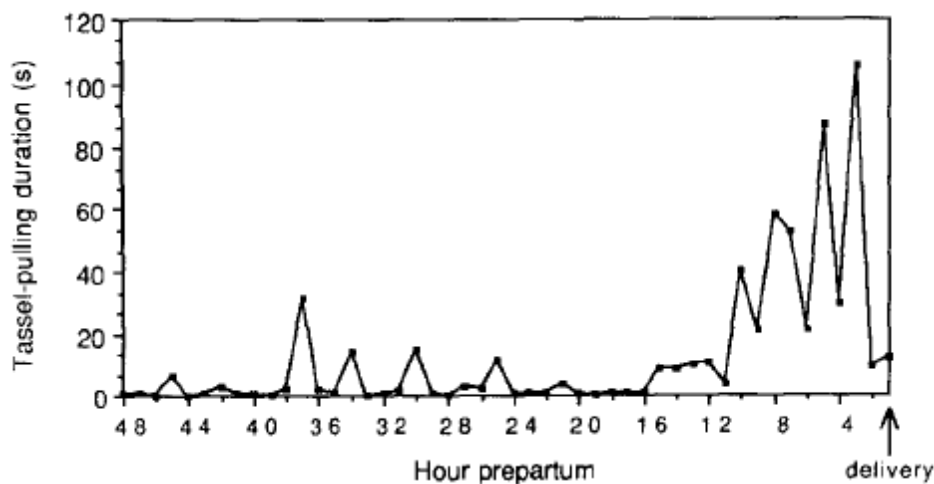


Fig. 2. Mean durations (s) of tassel-pulling per pre-partum hour for 13 sows (Widowski and Curtis, 1990).

More recent research has investigated the use of Jute bags (cloth/ hessian sacks) as nesting material (Hoofs, 2012). These sacks were attached to the farrowing crate by the head of the sow (N = 38 sows with jute sacks, rope, and straw balls, N = 30 sows with rope only). Sows were observed 12 hours before the birth of the first piglets, during farrowing, and for the first 24 hours following parturition. It was found that sows with access to jute sacks performed fewer postural changes than control sows, and peripartal (i.e. during farrowing) piglet crushing was lower in sows with jute bags (0.21%) compared to sows without (0.61%) (Hoofs, 2012). There was no difference in piglet mortality at 48 hours post farrowing or at weaning. It was concluded that sows preferred the jute sacks to rope and straw balls during the pre-farrowing period, given that sows with rope only were observed to spend more time interacting with the floor and walls of the pen (Hoofs, 2012).

Conclusion

In terms of the critical period during which sows may benefit from having nesting material available, this probably corresponds to the period during which the most intense nesting behaviour is performed. Based on the pattern of hormonal secretion prior to parturition, and behavioural observations of pre-parturient sows, a nesting substrate provided 24 – 48 hours before parturition should ensure that sows have access to nesting material when they are most likely to require it. However, there is a lack of information relating to the management of bedding material in the farrowing area. If nesting material was provided earlier than 24 – 48 hours pre-farrowing, sows would need to be monitored regularly to avoid excessive soiling of the farrowing space and/or blockage of the slatted flooring and the drainage system. Regularly entering the farrowing space to remove soiled bedding may be disruptive to sows that are close to parturition. The extra labour required to manage nesting material is unknown; the frequency with which sows should be provided extra material until farrowing has not been determined, and the proportion of bedding that is lost due to wastage and/or soiling has not been quantified. Furthermore, there is likely to be some variability between sows that has an impact on the amount of nesting material that is required on an individual basis. All of these factors represent a trade-off between accommodating the needs of the sows, and optimising the management of sows and piglets in existing farrowing and lactation accommodation.

References

- Algers, B. and Uvnäs-Moberg, K. 2007. Maternal behaviour in pigs. *Hormones and Behaviour* 52: 7 – 85.
- Andersen, I. L., Vasdal, G. and Pedersen, L. J. 2014. Nest building and posture changes and activity budget of gilts housed in pens and crates. *Applied Animal Behaviour Science* 159, 29 – 33.
- Burne, T. H.J., Murfitt, P. J. E. and Gilbert, C. L. 2000. Influence of environmental temperature on prostaglandin $F_{2\alpha}$ – induced nest building in female pigs. *Applied Animal Behaviour Science* 71, 293 – 304.
- Castrén, H., Algers, B., de Pasillé, A. -M., Rushen, J. and Uvnäs-Moberg, K. 1993. Parturient variation in progesterone, prolactin, oxytocin and somatostatin in relation to nest building in sows. *Applied Animal Behaviour Science* 38: 91 – 102.
- Cronin, G. M., Smith, J.A., Hodge, F. M. and Hemsworth, P. H. 1994. The behaviour of primiparous sows around farrowing in response to restraint and straw bedding. *Applied Animal Behaviour Science* 39, 269 – 280.
- Damm, B. I., Bildsoe, M., Gilbert, C., Ladewig, J. and Vestergaard, K. S. 2002. The effects of confinement on periparturient behaviour and circulating prolactin, prostaglandin $F_{2\alpha}$ and oxytocin in gilts with access to a variety of nest materials. *Applied Animal Behaviour Science*, 76, 135 – 156.
- Hoofs, A. 2012. Pro Dromi Easy Nesting geeft rust en minder doodliggers. *Swine Innovation Centre, Wageningen University, The Netherlands*.
- Jarvis, S., Calvert, S. K., Stevenson, J., vanLeeuwen, N. and Lawrence, A. B. 2002. Pituitary-adrenal activation in pre-parturient pigs (*Sus scrofa*) is associated with behavioural restriction due to lack of space rather than nesting substrate. *Animal Welfare* 11: 371 – 384.
- Peltoniemi, O. A. T and Oliviero, C. 2015. Housing, management and environment during farrowing and early lactation. In: Chantal Farmer (ed). The gestating and lactating sow, 231 – 252. *Wageningen Academic Publishers*.
- Vanheukelom, V., Dreissen, B. and Geers, R. 2012. The effects of environmental enrichment on the behaviour of suckling piglets and lactating sows: A review. *Livestock Science* 143, 116 – 131.
- Widowski, T. M. and Curtis, S. E. 1990. The influence of straw, cloth tassel, or both on the prepartum behaviour of sows. *Applied Animal Behaviour Science* 27, 53 – 71.
- Widowski, T. M., Curtis, S.E., Dziuk, P. J., Wagner, W. C. and Sherwood, O. D. 1990. Behavioural and endocrine responses of sows to prostaglandin F $_2$ -alpha and cloprostenol. *Biology of Reproduction* 43: 290 – 297.